UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/817,264	04/02/2004	Clark E. Lubbers	STL11420	1793

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EXAMINER
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ART UNIT	PAPER NUMBER
2189	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	12/21/2006	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

-- *The MAILING DATE of this communication appears on the cover sheet with the correspondence address* --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *03 November 2006*.

2a)☒ This action is **FINAL**.   2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-4,8,9,13,14,16-21,25 and 27-34* is/are pending in the application.

   4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-4,8,9,13,14,16-21,25 and 27-34* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

   Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

   Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   a)☐ All   b)☐ Some * c)☐ None of:

   1.☐ Certified copies of the priority documents have been received.

   2.☐ Certified copies of the priority documents have been received in Application No. _____.

   3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

   * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
   Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413)
   Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

This final Office action is in response to the amendment received 11/3/06.

Claims 1-4, 8, 9, 13, 14, 16-21, 25, and 27-34 remain pending. All objections and

rejections not repeated below are withdrawn.

Response to Arguments

Applicant's arguments and the request for an interview regarding the previous

rejection are moot in view of the new grounds of rejection.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that

form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-4, 8, 9, 16, 17, 21, 25, and 27-34 are rejected under 35 U.S.C. 102(b)

as being anticipated by U.S. Patent 6,425,052 to Hashemi.

Regarding claims 1 and 16, Hashemi shows the claimed grid-based data storage

system comprising an array of equal capacity data storage units in Fig. 6.

Hashemi shows the claimed data storage units (data stripes A-C and mirrored

data stripes A-C), each defined as a grouped plurality of data storage blocks (stripe

units A1, A2, A3, etc.) from separate storage domains (devices 1-5) as claimed.

Furthermore, he shows that each data storage unit (stripe) is individually

allocated for storing either user data entirely (data stripes) or fault tolerance data

entirely (mirrored data stripes) as claimed.

Regarding claim 2, Hashemi's device performs the claimed aligning since each

stripe unit is the same size. The base address of any given stripe is a multiple of the

size of the stripe units.

Regarding claim 3, Hashemi's device clearly uses pointer to identify a selected

stripe. Pointers are merely addresses that "point" to a particular location in a memory or

disk.

Regarding claim 4, Hashemi's fault tolerance data is characterized as mirror data

as claimed.

Regarding claim 8, Hashemi does not explicitly disclose the claimed sparing

table, however it is inherent in his device to keep track of the location of the spares and

their status in the array.

Regarding claim 9, Hashemi's inherent sparing table necessarily contains the plurality of sparing versions since it must specify the different devices as containing the spare data block in each row (see Fig. 6, each spare in a different device than the one in the preceding stripe).

Regarding claim 17, Hashemi shows the claimed plurality of spare storage blocks as spare 1, spare 2, etc.

Regarding claim 21, Hashemi shows the claimed data structure having an array of equal capacity data storage units in Fig. 6.

Hashemi shows the claimed data storage units (data stripes A-C and mirrored data stripes A-C), each defined as a grouped plurality of data storage blocks (stripe units A1, A2, A3, etc.) from separate storage domains (devices 1-5) as claimed.

He does not explicitly show the claimed pointer, however it is inherent in his device since it must have a pointer to locate the various stripes and stripe units. A pointer is nothing more than an address and the calculations mentioned in the claim would produce the claimed base address when performed on the address of the first (or last, depending on orientation) stripe. For example, the address used to locate the first stripe in Hashemi's device would produce a base address when multiplied by the size of a stripe unit and the number of stripes, as claimed.

Regarding claim 25, Hashemi shows the claimed data storage system having an array of equal capacity data storage units in Fig. 6.

Hashemi shows the claimed data storage units (data stripes A-C and mirrored data stripes A-C), each defined as a grouped plurality of data storage blocks (stripe units A1, A2, A3, etc.) from separate storage domains (devices 1-5) as claimed.

He does not explicitly teach the claimed steps of determining and issuing, however his device necessarily performs these steps in normal operations. When accessing a stripe unit on a particular device, Hashemi's device necessarily must determine the domain and a physical address for the stripe unit. The claimed calculations are necessary to access the desired stripe unit within the array. Once the physical address is determined, an access command must be issued to the device containing that address as claimed.

Regarding claim 27, Hashemi's stripe units are of equal capacity as claimed.

Regarding claim 28, each strip unit in a given stripe has the same address within its device as claimed.

Regarding claim 29, Hashemi discusses various RAID levels which use the user data, mirror data, and parity data as claimed.

Regarding claim 30, Hashemi shows three rows in Fig. 4A with no mirror data or

parity data as claimed.

Regarding claim 31, Hashemi mentions RAID 5 at column 2, line 30 and

following.

Regarding claim 32, Hashemi does not explicitly mention the claimed metadata

but it is inherent in his system since there must be something to define the pointers that

keep track of the stripes.

Regarding claim 33, each stripe has a base address that is aligned with an

address defined by a multiple of the size of the stripe units, as claimed.

Regarding claim 34, Hashemi's fault tolerance data is shown as mirror data, and

he discusses parity data at column 2, lines 1, 32, 34, 36, and 38.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set
> forth in section 102 of this title, if the differences between the subject matter sought to be patented and
> the prior art are such that the subject matter as a whole would have been obvious at the time the
> invention was made to a person having ordinary skill in the art to which said subject matter pertains.
> Patentability shall not be negatived by the manner in which the invention was made.

Claims 13, 14, 18, 19, and 20 are rejected under 35 U.S.C. 103(a) as being

unpatentable over U.S. Patent 6,425,052 to Hashemi.

Regarding claim 13, Hashemi does not teach that his device includes a plurality

of arrays, therefore he does not teach a metadata entry identifying the array in which

each stripe exists.

However, it would have been obvious to one of ordinary skill in the art at the time

the invention was made to use Hashemi's device in a larger system having plural arrays

to increase the amount of storage area available to the user, and then it would be

necessary to create metadata entries to identify each stripe and the array in which the

stripe exists.

Regarding claim 14, it would further have been obvious to include the storage

format of each stripe in the metadata entry to keep track of the different storage formats

which were possible in the system. Hashemi discloses multiple RAID levels as an

example of the different storage formats that can be used to store data.

Regarding claim 18, Hashemi shows the claimed grid-based data storage system

comprising an array of equal capacity data storage units in Fig. 6.

Hashemi shows the claimed data storage units (data stripes A-C and mirrored

data stripes A-C), each defined as a grouped plurality of data storage blocks (stripe

units A1, A2, A3, etc.) from separate storage domains (devices 1-5) as claimed.

Furthermore, he shows that each data storage unit (stripe) is individually allocated for storing either user data entirely (data stripes) or fault tolerance data entirely (mirrored data stripes) in a first storage format (RAID 1, mirroring) as claimed.

He does not teach reallocating the stripes in accordance with a second storage format if the number of stripes in the first storage format is less than the number of stripes in the second storage format.

However, it would have been obvious to one of ordinary skill in the art at the time the invention was made to perform such reallocating in order to be able to store additional data on the disks. For example, given the RAID 1 mirroring arrangement of Fig. 6 of Hashemi, or Fig. 4A more simply (without sparing), there are only three stripes of data shown (A, B, and C). Mirrored data stripes are identical copy stripes and therefore provide fault tolerance, but at the cost of consuming as much storage space as the original data stripes.

Storing these mirrored data stripes effectively reduces the storage capacity of the overall system by one-half. In other words, only half of the storage capacity is actually used for storing original data. The other half is consumed by storing the mirrored data stripes. Some system designers choose to pay this price in order to achieve the benefits of full redundancy (including highly available backup data), but when a storage system becomes full, it would be obvious to one of ordinary skill in the art to reallocate the stripes in accordance with a different storage format (such as RAID 0 or RAID 5, for example, both mentioned by Hashemi) that required less space. This would enable the

system to store additional data at the cost of giving up the benefits of storing mirrored

data stripes.

Regarding claim 19, Hashemi does not teach defining a second array and

allocating additional stripes in that array, however, it would have been obvious to one of

ordinary skill in the art at the time the invention was made to define a second array if the

first array was full. This would allow additional data storage.

Regarding claim 20, Hashemi's device performs the claimed steps as evidenced

by Figs. 6-8 which show a failure of device 2 and the regeneration or copying of the lost

data into the spare locations shown in Fig. 6. Hashemi may not explicitly mention each

of the claimed steps but his device necessarily performs them to accomplish the

recovery from the failure of device 2.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in

this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP

§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37

CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE

MONTHS from the mailing date of this action. In the event a first reply is filed within

TWO MONTHS of the mailing date of this final action and the advisory action is not

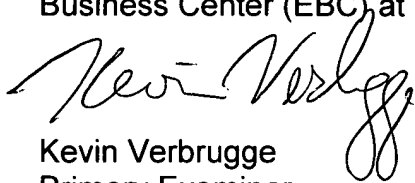mailed until after the end of the THREE-MONTH shortened statutory period, then the

shortened statutory period will expire on the date the advisory action is mailed, and any

extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

the advisory action. In no event, however, will the statutory period for reply expire later

than SIX MONTHS from the date of this final action.

Any inquiry concerning this Office action should be directed to the Examiner by

phone at (571) 272-4214.

Any response to this Office action should be labeled appropriately (including

serial number, Art Unit 2189, and type of response) and mailed to Commissioner for

Patents, P.O. Box 1450, Alexandria, VA 22313-1450, hand-carried or delivered to the

Customer Service Window at the Randolph Building, 401 Dulany Street, Alexandria, VA

22313, or faxed to (571) 273-8300.

Information regarding the status of an application may be obtained from the

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you have questions on access to the Private PAIR system, contact the Electronic

Business Center (EBC) at 866-217-9197.

Kevin Verbrugge
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Art Unit 2189